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मानक

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IS 3846 (1984): Rot-Proofed Cotton Tapes for Aerospace Purposes [TXD 13: Textile Materials for Aerospace Purposes]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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IS : 3846 - 1984

REAFFIRMED

1 - FEB 2005

Indian Standard
SPECIFICATION FOR
ROT-PROOFED COTTON TAPES
FOR AEROSPACE PURPOSES
(*First Revision*)

UDC 677.754 : 677.862.53 : 629.78



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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

AMENDMENT NO. 2 MAY 2004
TO
IS 3846 : 1984 SPECIFICATION FOR ROT-PROOFED
COTTON TAPES FOR AEROSPACE PURPOSES

(First Revision)

(Page 4, clause 3.4.1) — Substitute the following for the existing:

'3.4.1 The tapes shall be rot-proofed with pentachlorophenyl laurate (PCPL) from aqueous emulsions in accordance with IS 11662 : 1986 Specification for preservative treatment of textiles. The PCPL content shall not be less than 3.5 percent on oven dry mass of the tape when tested by the method prescribed in Appendix E. However, if agreed to between the buyer and the seller any other rot-proofing agent may also be used.'

(TX 13)

Reprography Unit, BIS, New Delhi, India



AMENDMENT NO. 1 JUNE 1986

TO

IS:3846-1984 SPECIFICATION FOR ROT-PROOFED
COTTON TAPES FOR AEROSPACE PURPOSES

(First Revision)

(Page 7, Table 3, col 1, second entry) - Substitute '101',, 300' for '001',, 300'.

(TDC 27)

Reprography Unit, ISI, New Delhi, India

Indian Standard

SPECIFICATION FOR ROT-PROOFED COTTON TAPES FOR AEROSPACE PURPOSES

(*First Revision*)

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(*Continued on page 2*)

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(Continued from page 1)

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Indian Standard
**SPECIFICATION FOR
ROT-PROOFED COTTON TAPES
FOR AEROSPACE PURPOSES**
(First Revision)

0. F O R E W O R D

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 15 October 1984, after the draft finalized by the Textile Materials for Aerospace Purposes Sectional Committee had been approved by the Textile Division Council.

0.2 This standard was first published in 1966 and has now been revised in the light of experience gained during its use. The majority of widths of tape for which details of construction and properties have been specified are multiples of 5 mm and it is hoped that only those tapes, or others in the same category, will be used in new designs. Details of three widths which are not multiples of 5 mm are also given, as an interim measure only; these are non-preferred widths and it is intended to omit these after the manufacturers and users have changed over.

0.3 In the preparation of this standard, considerable assistance has been derived from BS : 5F. 47-1972 'Specification for cotton tape', Aerospace series, issued by the British Standards Institution.

0.4 Tapes conforming to this standard are intended for use on metallic surfaces of the aircraft, such as ribs, leading edge, trailing edge and any other part to be subsequently covered with fabric.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS:2-1960*. The number of significant places retained in rounded off value should be the same as that of the specified value in this standard.

*Rules for rounding off numerical values (revised).

1. SCOPE

1.1 This Indian standard specifies the requirements for 10 varieties of cotton tapes, scoured, undyed or dyed and rot-proofed for aerospace purposes.

2. GENERAL REQUIREMENTS

2.1 Yarn — The tape shall be manufactured from un-sized cotton yarns of nominal counts as follows:

- a) Warp — 2 ply yarn of resultant count 20 tex; and
- b) Weft — singles of 17 tex count.

2.2 Tapes — The tapes shall be of plain weave and uniformly woven with firm selvages and shall be reasonably free from defects as given in Appendix A. Shuttleless construction shall not be permitted.

3. SPECIFIC REQUIREMENTS

3.1 Construction and Physical Properties — The tapes shall comply with the requirements of Table 1.

3.2 Dyeing — If required, either the tapes or the yarns from which it is to be manufactured shall be dyed with suitable dyes to shades as agreed to between the buyer and the seller. Sulphur dyes shall not be used. The colour shall be as stated in the contract or the order.

3.2.1 If dyed, the tapes shall conform to the colour fastness requirements as laid down in Table 2.

3.3 Chemical Requirements — The tapes shall also conform to the chemical requirements as laid down in Table 2.

3.4 Rot-Proofing

3.4.1 The tapes shall be rot-proofed by even and through impregnation with an aqueous emulsion or solvent solution either of lauryl pentachlorophenol (LPCP) or of pentachlorophenyl laurate (PCPL). This shall be followed by removal of excess and subsequent drying or thorough solvent removal. The treated textile shall be dry in handle and non-tacky. The LPCP or PCPL content of the treated textile shall not be less than 2.0 percent nor more than 3.5 percent on the oven dry mass of the textile material when tested by the methods prescribed in IS: 3522 (Part 2)-1970* or in Appendix E, respectively.

3.4.1.1 The free pentachlorophenol content of the treated textile shall not exceed 10 percent of the LPCP or PCPL content (*see* Note under E-3).

*Method for estimation of common preservatives used in textile industry: Part 2.

TABLE 1 CONSTRUCTIONAL AND PHYSICAL PROPERTIES

(Clause 3.1)

VARIETY No.	WIDTH	LENGTH	ENDS IN FULL WIDTH	PICKS PER cm, Min	MASS, Max	INDIVIDUAL BREAKING LOAD ON FULL WIDTH \times 20 cm STRIPS, Min
(1)	(2)	(3)	(4)	(5)	(6)	(7)
	mm	m			g/m	N
i)	10 \pm 1.0	65	36	$\begin{array}{c} \uparrow \\ +4 \\ 17 \\ -0 \\ \downarrow \end{array}$	1.2	80
ii)	13 \pm 1.0		48		1.6	105
iii)	15 \pm 1.0		57		1.9	125
iv)	20 \pm 1.0	or as	72		2.4	160
v)	25 \pm 1.5	agreed to	96		3.2	215
vi)	30 \pm 1.5	between	116		3.9	260
vii)	32 \pm 1.5	the buyer	120		4.0	265
viii)	38 \pm 1.5	and the	144		4.8	320
ix)	40 \pm 2.0	seller	150		5.1	330
x)	50 \pm 2.0		192		6.3	430
Method of Test	Appendix B	Appendix D	IS:1963-1981*	IS:1963-1981*	Appendix C	IS:1969-1968†

*Methods for determination of threads per unit length in woven fabrics (*first revision*).

†Methods for determination of breaking load and elongation at break of woven textile fabrics (*first revision*).

4. PACKING

4.1 The tapes shall be made into rolls of 65 m lengths or any other length as agreed to between the buyer and the seller.

4.2 The rolls shall be individually wrapped in kraft paper or in polyethylene film having thickness not less than 40 microns and a number of such rolls shall be packed in wooden packing cases previously lined with a layer of water-proof packing material such as polyethylene film or in high density polyethylene woven sacks (*see* IS:9755-1981*). The number of rolls to be packed in a case shall be as agreed to between the buyer and the seller.

*Specification for high density polyethylene (HDPE) woven sacks for packing fertilizers.

TABLE 2 CHEMICAL REQUIREMENTS

(Clauses 3.2.1 and 3.3)

SL No.	CHARACTERISTIC	REQUIREMENT	METHOD OF TEST
(1)	(2)	(3)	(4)
i)	Scouring loss percent, <i>Max</i>	2	IS:1383-1977* (Severe method)
ii)	Water soluble matter, percent, <i>Max</i>	1	IS:3456-1966†
iii)	‡Colour fastness to		
a)	Light	5 or better	IS:686-1957§ IS:2454-1967
b)	Water, change in colour	5	IS:767-1956¶

*Methods for determination of scouring loss in grey and finished cotton textile materials (*first revision*).

†Method for determination of water soluble matter of textile materials.

‡Applicable to dyed tapes only.

§Method for determination of colour fastness of textile materials to daylight.

||Method for determination of colour fastness of textile materials to artificial lights (xenon lamp).

¶Method for determination of colour fastness of textile materials to water.

5. MARKING

5.1 Each roll of tapes shall be legibly marked with the following information by stitching a cloth label to the inner end and attaching a tag to the outer end:

- Name of the material;
- Width of the tape (mm);
- Length of the roll (m);
- Name of the manufacturer, initials or trade-mark, if any; and
- Month and year of manufacture.

5.1.1 Each roll of tape may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions, under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

6. SAMPLING

6.1 Lot — The quantity of a definite variety and quality of tape delivered to one buyer against one despatch note shall constitute a lot.

6.2 The conformity of the lot to the requirements of this standard shall be determined on the basis of tests carried out on the samples selected from the lot.

6.3 Unless otherwise agreed to between the buyer and the seller, the number of rolls to be selected at random from a lot shall be in accordance with col 2 of Table 3.

6.4 For evaluating (a) ends in full width and picks per decimetre, (b) width, and (c) length, the rolls selected as in col 2 of Table 3 shall constitute the test sample.

6.5 For evaluating (a) mass, (b) breaking load, (c) water soluble matter, (d) scouring loss, and (e) colour fastness, the number of rolls specified in col 4 of Table 3 shall constitute the test sample. These rolls shall be selected at random from those selected in col 2 of Table 3. The required number of test specimens shall be drawn from each roll and subjected to corresponding tests.

NOTE — In the case of breaking load tests, at least 10 representative test specimens shall be drawn from each roll for the purpose of tests.

TABLE 3 SAMPLE SIZE AND CRITERIA FOR CONFORMITY

[*Clauses 6.3, 6.4, 6.5 and 6.6(a)*]

LOT SIZE (ROLLS)	SAMPLE SIZE (NUMBER OF ROLLS TO BE SELECTED)	PERMISSIBLE NUMBER OF NON- CONFORMING ROLLS	SUB-SAMPLE SIZE (NUMBER OF ROLLS TO BE SELECTED)
(1)	(2)	(3)	(4)
Up to 100	10	1	5
101 „ 300	15	1	6
301 „ 500	25	2	7
501 „ 800	35	3	8
801 „ 1300	50	4	9
1301 and above	75	6	10

6.6 Criteria for Conformity — The lot shall be considered to be in conformity with the requirements of this standard if the following conditions are satisfied:

- a) The number of rolls found non-conforming with respect to (i) ends in full width and picks per decimetre, and (ii) width, does not exceed the corresponding number given in col 3 of Table 3.
- b) In the case of length, the value obtained for each roll shall be compared with its declared or marked length. The mean percentage of deficiency in length, if any, shall be determined and made applicable to the lot.
- c) From the observed values of mass, water soluble matter and scouring loss, the average \bar{X} and the range R shall be calculated and the values of the expression $\bar{X} + 0.6 R$ shall be less than or equal to the specified values.
- d) The breaking load value of individual test specimen in a lot shall not be less than the value specified in this standard.
- e) The colour fastness ratings obtained in tests satisfy the corresponding requirements.

NOTE 1 — Average \bar{X} is the value obtained by dividing the sum of the observed values by the number of tests.

NOTE 2 — Range R is the difference between the maximum and the minimum in a set of observed values.

APPENDIX A

(Clause 2.2)

CLASSIFICATION OF MAJOR DEFECTS

A-1. Width Deviation — Any part outside the limits specified in this standard.

A-2. Warp Bow — Any part in which the warp bow when measured on a 1 m length exceeds 10 mm.

A-3. Slack or Unevenly Woven Selvedges — Any part that does not lie flat and even or shows a distinct 'saw tooth' effect.

A-4. Cut, Broken or Missing Threads — Two or more in warp or weft regardless of length.

A-5. Knots in Warp Ends or Weft Picks — One or more.

A-6. Floats — Any float affecting more than two ends and extending more than 6.5 mm.

A-7. Pick Variation — Variation outside the tolerances specified in this standard other than the slight local variation.

A-8. Mechanical Damage, Abrasion Marks — Any damage affecting the breaking load.

A-9. Inclusions — Any hard or soft foreign bodies which cause appreciable added thickness.

A-10. Cut, Hole or Tear — Three or more warp or weft threads ruptured at adjoining points.

A-11. Loops, Kinks, Snarls (Except Selvage) — All over 3 mm in length.

A-12. Selvage Cut, Broken, Torn, Scalloped — Any cut, broken, torn or scalloped selvage.

A-13. Spot, Stain or Streaks — a) Single ends or picks 40 cm or more in length, and b) Double ends or picks 20 cm or more in length.

A P P E N D I X B

(Table 1)

METHOD FOR DETERMINATION OF WIDTH OF THE TAPE

B-1. TEST SPECIMENS

B-1.1 For the purpose of this test, all the rolls in the test sample (*see* 6.4) shall constitute the test specimens.

B-2. PROCEDURE

B-2.1 Unroll one test specimen and lay a portion of it on a horizontal surface and smoothen it out with no greater tension than is necessary to make it lie straight and flat.

B-2.2 Measure to an accuracy of 1 mm the width of the tape by means of a graduated steel scale placed at right angles to the selvages.

B-2.3 Determine similarly the width of the tape at 5 different places uniformly distributed along the length of the roll. Calculate the mean of the 5 test values.

B-2.4 Repeat the test with the remaining test specimens.

B-3. REPORT

B-3.1 Report the lot to be in conformity with the relevant requirements of Table 1 if the number of rolls whose width varies from the relevant value specified in Table 1 by more than the tolerance prescribed in the table is not more than the corresponding number given in col 3 of Table 3.

A P P E N D I X C

(Table 1)

METHOD FOR DETERMINATION OF MASS

C-1. TEST SPECIMENS

C-1.1 Cut a piece of tape approximately 4 m in length from each of the rolls constituting the sample under test (*see* 6.5).

C-2. CONDITIONING OF TEST SPECIMENS

C-2.1 Prior to test, the test specimens shall be conditioned in a standard atmosphere at 65 ± 2 percent relative humidity at $270 \pm 2^\circ\text{C}$ temperature (*see* IS: 196-1966*) for 48 hours.

C-3. PROCEDURE

C-3.1 Take a test specimen and apply a tension equal to one percent of the minimum specified breaking load of the tape (*see* Note). After 60 ± 5 seconds, place two marks on the tape 3 m apart.

NOTE — The tension may be applied in a breaking load testing machine. It may also be applied by fixing one end of the tape to a peg, passing the tape around a pulley and hanging the desired load at the other end.

C-3.2 Release the load and cut the test specimen at the marks; then determine its mass to the nearest 0.1 g.

C-3.3 Calculate the mass of the tape per metre by the following formula:

$$W = \frac{W_1}{3}$$

* Atmospheric conditions for testing (*revised*).

where

W = mass of the tape (g/m); and

W_1 = mass of 3 m length of the tape (g) (*see* C-3.2).

C-3.4 Repeat the test with the remaining test specimens (*see* C-1.1).

C-4. REPORT

C-4.1 Report the lot to be in conformity with the relevant requirements of Table 1 if the condition prescribed in 6.6 (c) is satisfied.

A P P E N D I X D

(*Table 1*)

METHOD FOR DETERMINATION OF LENGTH OF ROLL

D-1. TEST SPECIMENS

D-1.1 For the purpose of this test, all the rolls in the test sample (*see* 6.4) shall constitute the test specimens.

D-2. EQUIPMENT

D-2.1 A flat table, little over 5 m long, having a smooth horizontal surface with markings in metres and centimetres on one side, shall be used.

D-3. PROCEDURE

D-3.1 Unroll one test specimen, draw one of its ends across the full length of the table and smoothen the portion of the tape on the table with no greater tension than is necessary to make it lie straight and flat.

D-3.2 Mark on the tape the first 5 m length as measured against the mark on the table. Measure the entire length, correct to a centimetre against the markings on the table.

D-3.3 Compare the value obtained in D-3.2 with the declared or marked length of the roll and note the deficiency in length, if any.

D-3.4 Repeat the test with the remaining test specimens and calculate the mean percentage deficiency in length, if any.

APPENDIX E

(Clause 3.4.1)

DETERMINATION OF PENTACHLOROPENYL LAURATE (PCPL) CONTENT

E-1. General — The method is applicable to the determination of PCPL in the absence of added pentachlorophenol. The proofing is hydrolyzed, acidified and steam distilled and the pentachlorophenol in the distillate extracted with 1, 1, 1-trichloroethane and complexed with copper sulphate-pyridine reagent. The optical density of the complex in 1, 1, 1-trichloroethane is measured on a suitable spectrophotometer at 450 nm.

E-2. Reagents

E-2.1 Ehanediol (ethylene glycol).

E-2.2 1, 1, 1-trichloroethane.

E-2.3 Pyridine (AR, GPR grade).

E-2.4 Sodium hydroxide, pellet.

E-2.5 Copper sulphate solution 50 g/l.

E-2.6 Pentachlorophenol (standard reagent), melting point 188°C minimum.

E-2.7 Hydrochloric acid, concentrated, 36 percent (m/v) (11 M).

E-2.8 Copper Sulphate — Pyridine reagent prepared by mixing 4 ml pyridine with 6 ml copper sulphate solution immediately before use.

E-3. Procedure — Weigh 2.5 ± 0.05 g of the material, cut into small pieces of no more than 5 mm square and place in a dry 250 ml round flask (B24/29 socket). Add 30 ml of ethanediol, 4 g of sodium hydroxide (pellet form), 2-4 ml of water, in that order and a few anti bumping granules. Connect the flask with a double surface condenser, bring the contents to boiling point on a sand bath and boil them vigorously for 30 minutes under reflux. After this allow the contents of the flask to cool, remove the reflux condenser and add through a funnel 60 ml water followed by 20 ml hydrochloric acid. Steam distill the contents of the flask ensuring that a constant volume is maintained by applying gentle heat as necessary. Collect 300 ml of distillate in a suitable receiver, applying care to prevent loss of pentachlorophenol in the distillate by adequate cooling. Discontinue the external heating of the flask a few minutes before disconnecting the steam supply. Disconnect the condenser and fit it vertically over the distillate receiver. Wash down the condenser with 25 to 30 ml of trichloroethane and collect the washing in the distillate. Transfer

the distillate and trichloroethane washings to a 500 ml separating funnel and shake thoroughly. Allow the layers of water and trichloroethane to separate completely before running off the trichloroethane layer into a 100 ml separating funnel. Wash the condenser and distillate receiver with a further 25 to 30 ml trichloroethane and add this to the aqueous solution into the 500 ml separating funnel. Repeat the extraction as given above and add the trichloroethane layer to the first trichloroethane extract in the 100 ml separating funnel. Add to the bulked trichloroethane extract 10 ml of copper sulphate-pyridine reagent, and shake well. After complete separation of the aqueous and trichloroethane layers, run the lower trichloroethane layer into a 100 ml volumetric flask through a small funnel containing anhydrous sodium sulphate supported by means of a quartz wool plug. Add a small quantity of trichloroethane to the copper sulphate-pyridine solution remaining in the separating funnel, shake and allow the layers to separate. Filter the trichloroethane layer through quartz wool plug and collect in the volumetric flask. Wash the filter with further small quantities of trichloroethane and finally make up to 100 ml trichloroethane.

Determine the optical density of the solution using a suitable spectrophotometer at 450 nm using trichloroethane as a blank. Estimate the PCPL content by reference to a calibration graph prepared from known standards of pentachlorophenol (1.0 percent pentachlorophenol = 1.71 percent PCPL).

NOTE — If the proofing is expected to contain both pentachlorophenol and PCPL then the free pentachlorophenol content should be determined as given in IS: 3522 (Part 1)-1966*; and the amount found deducted from the apparent PCPL content.

E-4. CALIBRATION

E-4.1 Direct — Prepare a calibration graph using 5, 10, 15 ml aliquots of a standard solution of pentachlorophenol reagent (1 g/200 ml) in trichloroethane to cover a range of 1, 2 and 3 percent respectively. Dilute each aliquot to 50-60 ml with trichloroethane, add 10 ml of copper sulphate-pyridine reagent, shake well and then follow the described procedure. Plot optical density against concentration of PCPL.

E-4.2 Indirect — Prepare a calibration graph using 5, 10 and 15 ml aliquots of a standard solution of pentachlorophenol reagent (1 g/200 ml) in dilute sodium hydroxide solution (sufficient for complete solution of pentachlorophenol). Place each aliquot in a round bottomed flask, add 60 ml water and 20 ml hydrochloric acid. Fit the flask for a steam distillation and then follow the described procedure.

If the distillation technique is satisfactory then the graphs obtained as in E-4.1 and E-4.2 should be the same.

*Method for estimation of common preservatives used in textile industry, Part 1.

INDIAN STANDARDS

ON

TEXTILE MATERIALS FOR AEROSPACE PURPOSES

IS:

- 514-1978 Mercerized cotton fabrics for covering aircrafts and gliders (*second revision*)
- 714-1979 Cotton reinforcing tape for aerospace purposes (*second revision*)
- 1376-1979 Cotton sewing threads for aerospace purposes (*second revision*)
- 1402-1979 Braided cotton cords for aerospace purposes (*first revision*)
- 2196-1966 Linen sewing thread for aeronautical purposes (*revised*)
- 2197-1962 Braided (plaited) linen cord for aeronautical purposes
- 2198-1971 Flax webbing for aeronautical purposes (*first revision*)
- 2965-1964 Breaking cord for cotton parachutes
- 2970-1964 Cotton fabrics for supply-dropping parachutes
- 2971-1964 Cotton fabric for target sleeves
- 3243-1965 Nylon fabric for man-dropping parachutes
- 3244-1965 Cotton webbing, statichute
- 3255-1979 Scouted or dyed cotton tapes for parachutes (*first revision*)
- 3449-1979 Cotton webbing for parachutes (*first revision*)
- 3846-1984 Rot-proofed cotton tapes for aeronautical purposes (*first revision*)
- 4227-1981 Cord, nylon, braided for aerospace applications (*first revision*)
- 4228-1979 Nylon tapes for aerospace purposes (*first revision*)
- 4229-1978 Nylon sewing threads for aerospace purposes (*first revision*)
- 4437-1973 Braided nylon cord for personnel parachutes (*first revision*)
- 4719-1984 Wire-woven rayon fabric for aerospace purposes (*second revision*)
- 4726-1984 Light-weight nylon fabric for personnel parachutes (*first revision*)
- 4727-1968 Nylon webbing for aeronautical purposes
- 5010-1969 Nylon fabric for heavy supply-dropping parachutes
- 5304-1969 Nylon fabric for sea-mine parachutes
- 5716-1970 Cotton tapes for personnel parachutes
- 5746-1983 Finished woven glass fibre fabrics for plastic laminates for aeronautical purposes (*first revision*)
- 6349-1971 Tubular woven nylon tape
- 6879-1973 Fabric for target banner, radar responsive
- 5900-1973 Proofed nylon leno fabric
- 8947-1978 Material (nylon webbing) for aircraft safety belts
- 9267-1979 Tubular nylon webbing for aerospace purposes
- 10476-1983 Woven roving glass fabric for polyester-glass laminates for aerospace purposes

PUBLICATIONS OF INDIAN STANDARDS INSTITUTION

INDIAN STANDARDS

Over 11 500 Indian Standards covering various subjects have been issued so far. Of these, the standards belonging to the Textile Group fall under the following categories:

Aeronautical textiles
Chemical test methods
Colour fastness of textile materials
Cotton fabrics—handloom, khadi and mill-made
Dyestuffs
Grading of fibres and yarns
Grading of raw silk
Hosiery
Jute—bags and fabrics
Jute mill accessories
Narrow fabrics
National flag of India
Nylon fabrics
Packaging codes
Physical test methods
Rayon fabrics

Rayon fabrics, handloom
Ropes and cordages
Sampling of textiles, methods for
Silk fabrics—handloom and khadi
Sizing and finishing materials
Spinning machinery components
Terminology
Textile floor coverings
Textile materials for fishing
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Twines
Weaving machinery components
Wool fabrics—handloom, khadi, and mill-made
Yarn and similar structures
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